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IS 2283 (2000): Nickel Silver Sheet, Strip Specification
[MTD 8: Copper and Copper Alloys]

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(दूसरा पुनरीक्षण)

Indian Standard

NICKEL SILVER SHEET, STRIP AND FOIL — SPECIFICATION

(Second Revision)

ICS 77.150.30

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

August 2000 **Price Group 3**

Copper and Copper Alloys Sectional Committee, MTD 8

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1962 and subsequently revised in 1981.

The Nickel Silvers are a family of alloys of copper, nickel and zinc. A major property of these alloys is their colour which ranges from a soft ivory to silvery white, depending on the Nickel content. These alloys have been used for centuries under a variety of names, the most common being German Silver. With the exception of cupro-nickels, these are the only alloys of Copper that are white.

While reviewing this Indian Standard, the committee felt it necessary to revise it incorporating the following main modifications:

a) Scope, Clauses on Supply of Material, Terminology, Freedom from Defects, Chemical Composition. Physical Properties, Sizes and Tolerances, Edgewise Curvature, Sampling and Retesting, Packing, and Marking have been modified.

b) Tables 1, 2, 3, 4 and 5 have been modified.

c) A new clause on conditions of delivery has been incorporated.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

NICKEL SILVER SHEET, STRIP AND FOIL — SPECIFICATION

(*Second Revision*)

1 SCOPE

This standard specifies requirements for Nickel Silver sheet, strip and foil for general purposes such as Transistor cap, Utensils, Tableware, Cutlery, Camera parts, Decorative trims, Sliding piece of resistor, Electronic exchanges, spectacle frames, wind instruments, etc.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)
1501	Method for Vickers hardness test for metallic materials:
(Part 1) : 1984	HV 5 to HV 100 (*second revision*)
(Part 2) : 1984	HV 0.2 to less than HV 5 (*second revision*)
1599 : 1985	Method for bend test (*second revision*)
1608 : 1995	Mechanical testing of metals — Tensile testing (*second revision*)
3187 : 1985	Method of chemical analysis of copper nickel zinc alloys
3288	Glossary of terms for copper and copper alloys:
(Part 1) : 1986	Materials (*third revision*)
(Part 3) : 1986	Wrought forms

3 TERMINOLOGY

For the purpose of this standard, the definitions of terms as given in IS 3288 (Parts 1 and 3) shall apply.

4 SUPPLY OF MATERIAL

General requirements relating to supply of material shall conform to IS 1387.

5 CONDITIONS OF DELIVERY

The material shall be supplied in any one of the following conditions as specified by the purchaser:

O	Annealed (Soft)
HB	Half Hard
HC	Three Quarter Hard
HD	Hard
HE	Extra Hard

6 FREEDOM FROM DEFECTS

The sheet, strip and foil shall have clean, smooth and bright surface and shall have a workman like finish, homogeneity and free from defects that are harmful for practical use. The material shall be reasonably flat.

7 CHEMICAL COMPOSITION

The material, when analyzed by the method specified in IS 3187 or any other established instrumental/chemical method shall conform to the requirements as given in Table 1. In case of dispute,

Table 1 Chemical Composition

Sl No.	Alloy Designation	Meterial	Percent, Copper	Percent, Nickel	Percent, Iron *Max*	Percent, Lead *Max*	Percent, Manganese *Max*	Percent, Total Impurities *Max*	Percent, Zinc
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	NS - 10	10% Nickel Silver	60.0-65.0	9-11	0.25	0.04	0.50	0.50	Remainder
ii)	NS - 12	12% Nickel Silver	60.0-65.0	11-13	0.25	0.04	0.50	0.50	Remainder
iii)	NS - 15	15% Nickel Silver	60.0-65.0	14-18	0.25	0.04	0.50	0.50	Remainder
iv)	NS - 18	18% Nickel Silver	60.0-65.0	17-19	0.25	0.04	0.50	0.50	Remainder
v)	NS - 18 T[1)]	18% Nickel Silver	54.0-56.0	17-19	0.25	0.04	0.50	0.50	Remainder

[1)] For telecommunication purposes.

the procedure given in IS 3187 shall be the referee method. However when the method is not given in IS 3187 the referee method shall be as agreed to between the purchaser and the manufacturer.

8 MECHANICAL TEST

8.1 The material when tested in accordance with IS 1608 and IS 1501 (Parts 1 and 2) shall have mechanical properties as given in Table 2.

8.2 Bend Test

When bend test is carried out in accordance with IS 1599, shall have the properties as given in Table 3.

9 DIMENSIONS AND TOLERANCES

9.1 Preferred inside diameter of strip and foil shall be as per Table 4.

9.2 Thickness Tolerances

The thickness tolerences for sheet, strip and foil shall be as given in Table 5.

9.3 Width Tolerance

The width tolerances for sheet, strip and foil shall be as given in Table 6.

9.4 Length Tolerance for Sheet

The length tolerances for sheet shall be as given in Table 7.

9.5 Permissible Maximum Value on Camber for Strip

The permissible maximum value on camber for strip shall be as given in Table 8.

10 SAMPLING AND CRITERIA FOR CONFORMITY

Unless otherwise agreed between the purchaser and the manufacturers the following sampling procedure and criteria for conformity shall apply.

Table 2 Mechanical Properties of Nickel Silver Sheet, Strip and Foil

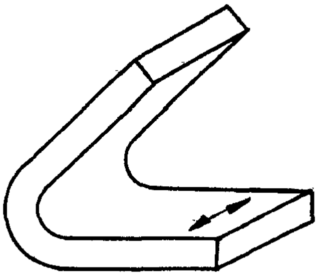
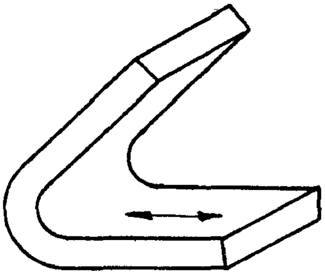
(*Clause* 8.1)

Sl No.	Grade	Condition	Tensile Strength, MPa *Min*	Elongation on 50 mm of Gauge Length *Min*	Hardness in HV
(1)	(2)	(3)	(4)	(5)	(6)
i)	NS-10	O	350	45	100 *Max*
		HB	400	20	125 *Min*
		HD	500	5	160 *Min*
		HE	580	—	185 *Min*
ii)	NS-12	O	380	40	105 *Max*
		HB	420	15	130 *Min*
		HD	520	3	160 *Min*
		HE	600	—	190 *Min*
iii)	NS-15	O	380	40	105 *Max*
		HB	420	15	135 *Min*
		HD	550	3	165 *Min*
		HE	650	—	195 *Min*
iv)	NS-18	O	400	40	110 *Max*
		HB	450	15	135 *Min*
		HD	550	3	170 *Min*
		HE	660	—	200 *Min*
v)	NS-18 T	O	380	40	85 *Max*
		HB	550	8	140 *Min*
		HC	600	5	170 *Min*
		HD	640	4	195 *Min*
		HE	720	—	220 *Min*

NOTE — The tensile test piece shall be taken in rolling direction.

Table 3 Bend Test

(*Clause* 8.2)

Thickness	Condition	Transverse Bend Test 		Longitudinal Bend Test 	
		Angle	Radius	Angle	Radius
(1)	(2)	(3)	(4)	(5)	(6)
Up to and including 10 mm	O	180°	*t*	180°	*t*
	HB	180°	*t*	180°	*t*
	HC	90°	*t*	90°	*t*
	HD	90°	*t*	90°	*t*
	HE	—	—	90°	*t*

NOTE — *t* = thickness of the sheet and strip

Table 4 Preferred Inside Diameter of Strip and Foil in Coil

(*Clause* 9.1)

All dimensions in millimetres.

Sl No.	Thickness	Preferred Inside Diameter				
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Up to and including 0.16	100	150	—	—	—
ii)	Over 0.16 up to and including 0.5	100	150	200	300	—
iii)	Over 0.5 up to and including 1.0	—	150	200	300	400
iv)	Over 1.0 up to and including 3.0	—	—	—	300	400

Table 5 Thickness Tolerances for Sheet, Strip and Foil

(*Clause* 9.2)

All dimensions in millimetres.

Sl No.	Thickness Over and Up to	Thickness Tolerance		
		Up to and Including 160	Over 160 Up to and Including 300	Over 300 Up to and Including 450
(1)	(2)	(3)	(4)	(5)
i)	0.04 - 0.10	10% of specified	10% of specified	—
ii)	0.10 - 0.16	± 0.012	± 0.015	± 0.020
iii)	0.16 - 0.28	± 0.015	± 0.020	± 0.025
iv)	0.28 - 0.63	± 0.020	± 0.025	± 0.030
v)	0.63 - 0.90	± 0.025	± 0.030	± 0.040
vi)	0.90 - 1.20	± 0.030	± 0.040	± 0.050
vii)	1.20 - 2.00	± 0.040	± 0.050	± 0.060
viii)	2.00 - 2.80	± 0.050	± 0.060	± 0.070
ix)	2.80 - 3.50	± 0.060	± 0.070	± 0.090
x)	3.50 - 5.00	± 0.100	± 0.130	± 0.170
xi)	5.00 - 7.00	± 0.120	—	—

NOTES

1 When the tolerance is specified either only plus or only minus side, the value in the above table shall be doubled.

2 The thickness tolerance on exceeding the range of specified dimensions shall be agreed upon between the parties concerned with acceptance.

Table 6 Width Tolerances for Sheet, Strip and Foil

(*Clause* 9.3)

All dimensions in millimetres.

Sl No.	Width (Up to and Including)	Tolerance on Width (±) Thickness (Up to and Including)				
		0.25	0.55	1.00	2.00	4.00
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	10 -50	0.10	0.15	0.20	0.30	—
ii)	50 - 100	0.15	0.20	0.30	0.50	0.60
iii)	100 - 200	0.20	0.30	0.50	0.60	0.80
iv)	200 - 400	0.30	0.50	0.60	0.80	1.00

NOTES

1 When the tolerance is specified either only plus or only minus side, the value in the above table shall be doubled.

2 The width tolerance on exceeding the range of specified dimensions shall be agreed upon between the parties concerned with acceptance.

Table 7 Length Tolerance for Sheet

(*Clause* 9.4)

All dimensions in millimetres.

Sl No.	Thickness	Tolerances Up to and Including 1 220 mm
(1)	(2)	(3)
i)	0.04 Over up to and including 0.8	+ 5 0
ii)	Over 0.8 up to and including 5	+ 10 0

NOTE — The length tolerances on exceeding the range of specified dimensions shall be agreed upon between the interested parties concerned with acceptance.

Table 8 Permissible Maximum Value on Camber for Strip

(*Clause* 9.5)

All dimensions in millimetres.

Sl No.	Width	Permissible Maximum Value in Any 1 000 mm Length
(1)	(2)	(3)
i)	7 and Over up to and including 9	7
ii)	Over 9 up to and including 13	6
iii)	Over 13 up to and including 25	5
iv)	Over 25 up to and including 50	4
v)	Over 50 up to and including 100	3
vi)	Over 100 up to and including 450	2

NOTES

1 The term camber means the depth of the arc for the specified length.

2 The permissible maximum value in exceeding the range of the specified dimensions shall be agreed upon between the parties concerned.

10.1 Lot

In a consignment the sheets, strip and foil of the same width and thickness, and of the same temper shall be grouped together to form a lot not exceeding 1 000 kg. One or more lots may be formed from the material submitted for inspection depending on the mass of each lot shall be separately sampled for acceptance purposes.

10.2 Visual and Dimensional Requirements

All the coils shall be individually examined for manufacturing defects, surface defects and dimensional tolerances. No failure shall occur if the lot is to be accepted under this clause.

10.3 Chemical Composition and Mechanical Properties Requirements

From each lot, one sample per 1 000 kg or part thereof for chemical test and one sample per 250 kg or part thereof shall be tested for all mechanical tests. The samples shall be cut off cold and shall receive no further treatment (except that those to be machined to shape the test pieces) before being tested.

The lot shall be accepted under this clause if the samples tested meet all the chemical composition and mechanical properties requirements of the specification.

11 RETESTS

Should any one of the test samples, first selected, fail to comply the requirements specified, two further samples shall be selected from the lot represented by the sample which failed. Should both the test samples comply with the requirements, the lot shall be deemed to have passed. Should either of the retest samples fail, the lot represented shall be rejected.

12 PACKING

The material shall be suitably packed to cover all damages during transit or as required by the purchaser.

13 MARKING

13.1 Sheet, strip and foil shall be marked with the following items on each package on each coil or on each sheet by suitable means:

a) Grade, temper grade or its symbol;

b) Dimensions;

c) Batch number;

d) Name of manufacturer, or its indentifying brand; and

e) Or any such information required by the purchaser.

13.2 BIS Certification Marking

The material may also be marked with the Standard Mark.

13.2.1 The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of the conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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This Indian Standard has been developed from Doc : No. MTD 8 (4218).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at : Prabhat Offset Press, New Delhi-2